SARATOGA SPITTLEBUG EVALUATION ON THE SUPERIOR NATIONAL FOREST

By Imants Millers and Glen W. Erickson

ABSTRACT

Saratoga spittlebug scar-count surveys made in 1968 and 1969 show that damage is likely to occur in red pine plantations in the northwestern part of the Superior National Forest, Minnesota. Annual scar-count surveys are recommended for 5 Ranger Districts.

INTRODUCTION

The Saratoga spittlebug, Aphrophora saratogensis (Fitch), is a major pest of young red pine. In the Lake States, more than 200,000 acres have been sprayed since 1945 to prevent damage. the preponderance of the problem areas have followed increases in reforestation programs. Past outbreaks have occurred mainly in Michigan and Wisconsin. Recently, spittlebug damage has been found in Minnesota on the Chippewa National Forest and Red Lake Indian Reservation. Scar count surveys were initiated on the Superior National Forest after a damaged plantation was reported in 1967. This report summarizes the results of the 1968 survey (Millers, 1968) and presents the results of the 1969 survey.

BIOLOGICAL REVIEW

A. Causal Agent

The Saratoga spittlebug, Aphrophora saratogensis (Fitch).

B. Host

Red pine, Pinus resinosa Ait.
Alternate hosts are Comptonia sp., Rubus sp. and other woody shrubs.
Other pines in the area may be attacked, but damage usually is not serious.

C. Type of Damage

The adult spittlebugs feed on 1-5 year old internodes of branches and the main stem. Necrotic areas, i.e. scars, are produced in the phloem, cambium and newly formed xylem as a result of the feeding. One season's accumulation of 35 or more scars per 4 linear inches of twig interferes with food and water translocation. At first, stunting of terminal growth occurs. Continued severe feeding in successive years results in branch and terminal die-back, i.e. flagging, and eventually, tree mortality. Thus, economic loss occurs from tree growth reduction, poor tree form and quality, and tree mortality (Ewan, 1961).

D. Ecological Considerations

Spittlebug eggs overwinter under red pine bud scales on branches of the upper crown. Upon hatching, the young nymphs in May, drop from the tree and migrate to herbaceous plants. In 2 weeks they move to woody shrubs, particularly sweet fern, Comptonia sp., and raspberries, Rubus sp. Observations show that local alternate host preferences do occur.

The spittlebug abundance is related to the host and alternate hosts available for oviposition, nymphal development and adult feeding (Ewan, 1961). Generally, red pine plantations in the Lake States are susceptible to outbreak populations after the trees are 2 feet tall and until crown closure eliminates alternate hosts, i.e. tree height of about 14 feet with stocking at 1000 trees per acre. By causing tree stunting and mortality, unchecked spittlebug populations are able to maintain open red pine stands and thus prolong outbreak conditions. Other red pine pests, such as white grub, Scleroderris pine canker and defoliators may also open up pine stands and produce conditions favorable to spittlebug outbreaks.

Weather is another factor that effects spittlebug populations. Spittlebug nymphs are protected at the root collar of the alternate host. However, late spring temperatures in low 20's may cause nymphal mortality. Also, the nymphs desiccate readily during migration from red pine to herbaceous plants and later to woody shrubs.

A few parasites and predators are reported for Saratoga spittlebug, but none effectively reduce outbreak populations (Ewan, 1961).

SURVEY METHODS

Each year, 1968 and 1969, about five red pine plantations were examined on each of the Ranger Districts (see Map 1). In general, trees were 2-15 feet tall; plantations with taller trees were dropped from the survey. The following number of samples were taken in each plantation:

Size of Area	Minimum Number of Samples
10-20	10
21-80	20
81-160	30
161+	30 + 1 for each additional 10 acres

The samples were taken systematically along survey lines spaced to provide broad coverage of the area.

Each sample consisted of a 4 inch long penultimate branch internode from the upper whorls of the tree. The bark was removed and the number of feeding scars estimated and recorded as follows:

Number	Recorded as
0	0 (none)
1-5	1 (very light)
6-15	10 (light)
16-25	20 (moderate)
26-35	30 (high)
36+	+ (severe)

The scar-count surveys were made by Mr. T. Williams, Eveleth Nursery, with District assistance as needed. The data were evaluated by the St. Paul Field Office staff.

RESULTS AND DISCUSSION

Moderate to heavy Saratoga spittlebug infestations were found in the northwestern part of the Superior National Forest (Fig. 1), i.e. LaCroix, Kawishiwi, Halfway, northern half of Isabella, and Virginia Ranger Districts.

The survey results indicate that the Forest Managers should consider an annual scar-count survey program on the northwestern Ranger Districts (Table I). The recommendations in the table are based on the assumption that all the Districts will have a scar-count survey program. If there is none, the resurvey recommendations can be ignored. The Forest is advised that Halfway, Isabella, Kawishiwi and Virginia Ranger Districts should consider re-survey of susceptible plantations shown in Table I of this report, and Table VII of the previous years report (Millers, 1968). Plantations not susceptible to spittlebug damage, with trees approaching 15 feet height, are recommended to be dropped from future surveys because of low spittlebug damage hazard.

Poorly stocked plantations, lack of access by vehicle, plantations under 10 acres, and plantations that could not be found are recommended to be dropped from future spittlebug surveys. If the values justify the survey costs, the plantations should be scheduled for re-survey 4 years hence.

RECOMMENDATIONS

1. The Forest Manager is advised to consider an annual scar-count survey program on the Halfway, Isabella, Kawishiwi, LaCroix and Virginia Ranger Districts to detect Saratoga spittlebug outbreaks before significant losses occur. Each selected plantation is examined at least once in 4 years while the trees are susceptible. The selection of the plantations is made with the following economic considerations:

    a. Red pine values alone exceed the usual suppression costs.

    b. Insecticide use is permissible in the area.

    c. The survey costs will not exceed the plantation values; for planning purposes, average of four scar-count surveys may be assumed.

    All the red pine plantations in which surveys are justified will be examined systematically as follows:

    a. When trees have reached 2 feet height.

    b. The plantation has been released from overstory within the last 2 years.

c. The plantation was recommended for resurvey by the FPC as a result of previous surveys.

2. The FPC staff should conduct detection surveys in parts of the Forest where spittlebug damage has not been found, i.e. on the Aurora, Gunflint, Tofte, and Two Harbors Ranger Districts.

LITERATURE CITED

Ewan, H. G. 1961. The Saratoga Spittlebug. USDA Forest Service, Tech. Bull. 1250.

Millers, I. 1968. Biological Evaluation of Saratoga Spittlebug as based on 1968 Scar-Count Surveys on National Forests in the Lake States. USDA Forest Service, State and Private Forestry, NA St. Paul Field Office Report S-68-13.

Table I. RESULTS OF SARATOGA SPITTLEBUG SCAR-COUNT SURVEY - 1969 - SUPERIOR NATIONAL FOREST

Plantation Location				Area	Trees		Survey Results	
Plantation No.	T	R	S	Acres	T/A	Ht./Ft.	Scars	Recommendations 1/
Aurora Ranger District								
P-29a	57N	13W	32,33	54	350	4	L	SC-74
P-30a	57N	14W	34,35	55	500	4	L	SC-74
Area 22	58N	13W	30	21	---	--	-	Drop-NP
45	58N	14W	22	15	500	4	L	SC-74
Area 21	58N	14W	23,26	25	---	--	-	Drop-NP
Gunflint Ranger District								
90	63N	1W	10,11,14,15	65	500	9	L	Drop-T
88,89,90	63N	1W,1E	10,11/17,18	207	425	9	L	Drop-T
116,123,124	63N	1E/2E	13,23,24/18	107	350	9	L	Drop-T
115,124	63N	1E	15,22	69	450	10	L	Drop-T
124	63N	1E	23	117	775	10	L	Drop-T
Halfway Ranger District								
P-33a	60N	9W	6	50	776	8	L	Drop-Mixed Plant.
P-41a	61N	9W	25.26	142	400	--	-	Drop-NP
P-47	61N	9W	29,30	45	800	6	M	SC-71
P-38a	61N	9W	35,36	100	550	9	M	SC-71
P-35a	61N	10W	7,13	90	---	--	-	Drop-IN
Isabella Ranger District								
P-39a	60N	7W	3,4,9	218	50	9	L	Drop-T
P-43a	60N	8W	23	105	167	7	L	SC-74
P-37h	60N	8W	24	52	---	--	-	Drop-IN
P-37c	61N	7W	33	64	350	10	L	Drop-T
P-34	61N	8W	22,23,26,27	200	---	10	L	Drop-T
LaCroix Ranger District								
P-32b	65N	13W	18	32	300	5	M	SC-72
P-34c	65N	16W	11	12	700	6	H	SC-71
P-32d	65N	16W	11,14	47	300	6	M	SC-72
P-32c	65N	16W	23	10	500	6	M	SC-72
P-30e	65N	16W	24,25,26	33	500	7	M	SC-72
Tofte Ranger District								
P-56b	60N	3W	5,8,9	105	300	6	L	SC-73
P-49e	61N	6W	12	35	300	10	L	Drop-T
P-39c	62N	4W	31,32	74	300	12	L	Drop-T
P-48a	62N	5W	31	81	265	10	L	Drop-T
P-49c	62N	5W	32	33	300	5	L	SC-74
Two Harbors Ranger District								
P-22a	56N	12W	2	19	---	8	L	Drop-T
P-28c	56N	12W	21	14	---	--	-	Drop-PS
P-25a	57N	10W	5,8	64	590	8	L	Drop-T
P-22c	57N	10W	8	43	---	8	L	Drop-PS
P-27	58N	10W	32,33	76	600	5	L	SC-74
Virginia Ranger District								
P-40	59N	16W	15	13	---	8	M	SC-72
P-44	59N	19W	18	35	---	--	-	Drop-NS
P-42	60N	20W	14	10	---	6	M	SC-71
P-37a	60N	20W	25	14	---	7	L	SC-73
17,18	61N	18W	27,28	10	---	4	L	SC-74

1/ Recommendation Codes: SC - x = scar-count FY-x
PS = poor stocking
T = tall trees
NP = no plantation found
IN = Inaccessible

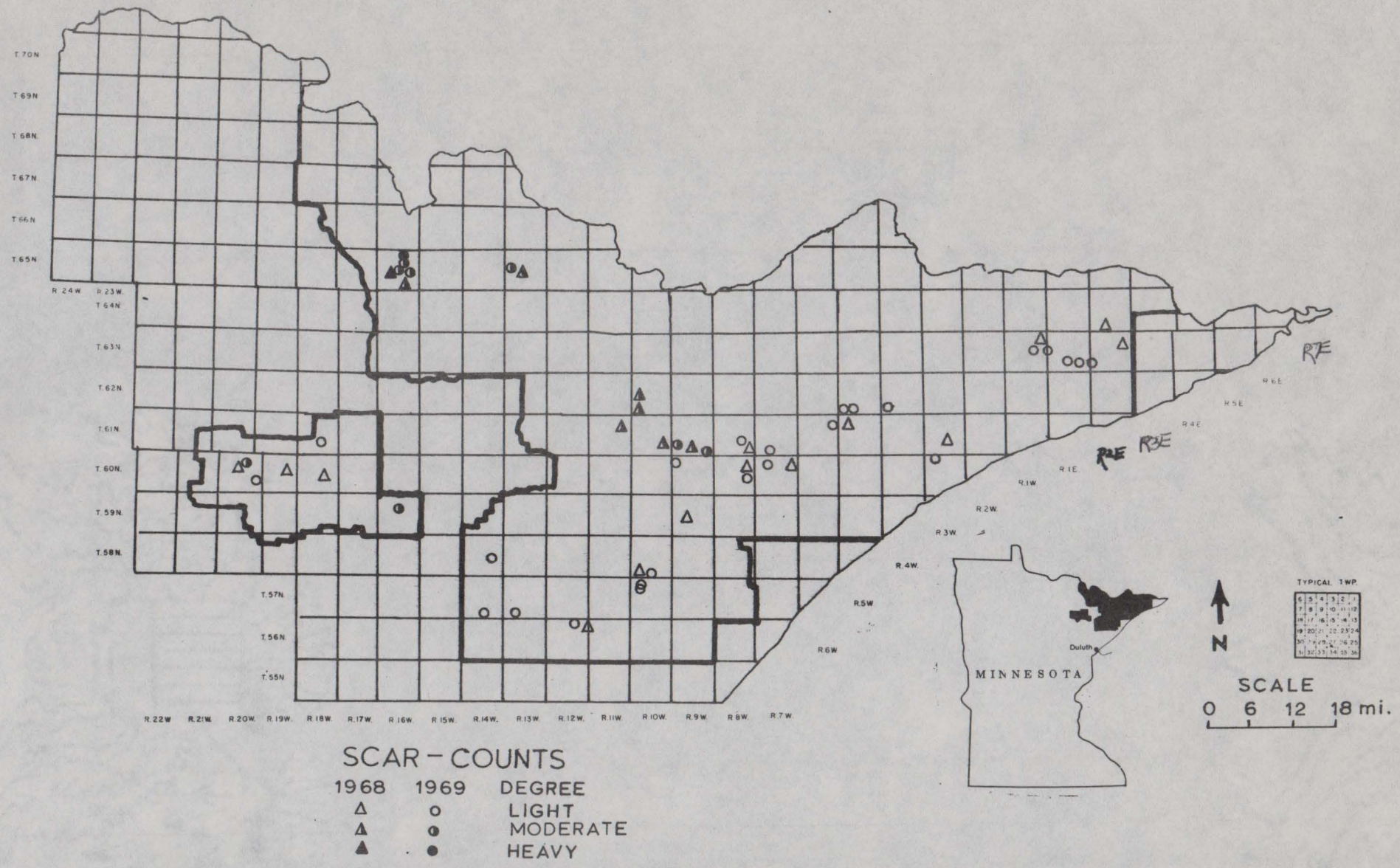

Figure 1. Saratoga spittlebug infested plantations on the Superior National Forest, as based on the 1968 and 1969 Scar-count Surveys.